

the pin and the shoulder portion are pressed against a predetermined joint spot of lapped works to be joined and inserted into the predetermined joint spot heated and softened due to friction heat,

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cont'd
portions of the lapped works that are in the vicinity of the predetermined joint spot are agitated by using the rotating pin and shoulder portion, thereby leading to the lapped works being fused at the predetermined joint spot,

the joining tool is then pulled out along the axis by the motion motor,

the joining tool is substantially prevented from moving in a direction crossing an axial direction thereof with respect to the lapped works from the time when the pin and the shoulder portion are pressed against the predetermined joint spot of the lapped works to the time when the joining tool is pulled out, and

whereby the lapped works are spot-joined at the predetermined joint spot.

18. A spot joining method comprising the steps of:

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rotating a joining tool having a column-shaped shoulder portion at a tip end portion thereof and a pin protruding from an end face of the shoulder portion along an axis thereof with the pin and the shoulder portion pressed against a predetermined joint spot of lapped works to be joined;

inserting the pin and the shoulder portion into the predetermined joint spot of the lapped works heated and softened due to friction heat;

agitating portions of the lapped works that are in the vicinity of the predetermined joint spot by using the rotating pin and shoulder portion, thereby leading to the lapped works being fused at the predetermined joint spot,

pulling out the joining tool along the axis, and

substantially preventing the joining tool from moving in a direction crossing an axial direction thereof with respect to the lapped works from the time when the pin and the shoulder portion are pressed against the predetermined joint spot of the lapped works to the time when the joining tool is pulled out, thereby performing spot joining of the lapped works at the predetermined joint spot.

26. An outer plate of an automobile manufactured by a method for spot-joining works at a joint spot, the method comprising the steps of:

rotating a joining tool having a column-shaped shoulder portion at a tip end portion thereof and a pin protruding from an end face of the shoulder portion along an axis thereof with the pin and the shoulder portion pressed against a predetermined joint spot of lapped works to be joined which constitute an outer plate of an automobile,

inserting the pin and the shoulder portion into the predetermined joint spot of the lapped works heated and softened due to friction heat,

agitating portions of the lapped works that are in the vicinity of the predetermined joint spot by using the rotating pin and shoulder portion, thereby leading to the lapped works being fused at the predetermined joint spot,

pulling out the joining tool along the axis, and

substantially preventing the joining tool from moving in a direction crossing an axial direction thereof with respect to the lapped works from the time when the pin and the shoulder portion are pressed against the predetermined joint spot of the lapped works to the time when the joining tool is pulled out,

thereby performing spot-joining of the lapped works at the predetermined joint spot.

27. A joining tool for spot-joining, wherein the joining tool has a column-shaped shoulder portion at a tip end portion thereof and a pin protruding from an end face of the shoulder portion along an axis thereof is rotated around the axis with the pin and the shoulder portion pressed against a predetermined joint spot of lapped works to be joined, the pin and the shoulder portion are inserted into the predetermined joint spot of the lapped works heated and softened due to friction heat, portions of the lapped works that are in the vicinity of the predetermined joint spot are agitated by the rotating pin and shoulder portion, the lapped works are fused at the predetermined joint spot, the joining tool is pulled out along the axis, the joining tool is substantially prevented from moving in a direction crossing an axial direction thereof with respect to the lapped works from the time when the pin and the shoulder portion are pressed against the predetermined joint spot of the lapped works to the

B3 time when the joining tool is pulled out, thereby the spot joining is performed, and a tip end portion of the pin has a raised central portion thereof.

B4 33. A joining tool for spot joining, wherein a joining tool having a column-shaped shoulder portion at a tip end portion thereof and a pin protruding from an end face of the shoulder portion along an axis thereof is rotated around an axis of the joining tool with the pin and the shoulder portion pressed against a predetermined joint spot of lapped works to be joined, the pin and the shoulder portion are inserted into the predetermined joint spot of the lapped works heated and softened due to friction heat, portions of the lapped works that are in the vicinity of the predetermined joint spot are agitated by using the rotating pin and shoulder portion, the lapped works are fused at the predetermined joint spot, the joining tool is pulled out along the axis, the joining tool is substantially prevented from moving in a direction crossing an axial direction thereof with respect to the lapped works from the time when the pin and the shoulder portion are pressed against the predetermined joint spot of the lapped works to the time when the joining tool is pulled out, thereby the spot-joining is performed,

a tip end portion of the pin has a raised central portion thereof, and the pin is coaxially protruded from an end face of a short-column shaped shoulder.

Please add new claims 28, 39 and 40 as follows:

125 38. The spot joining device according to claim 5, wherein a concave portion is formed at the joint spot of the lapped works on which the spot-joining was performed so as to conform in shape to the pin and the shoulder portion of the joining tool.

39. The spot joining method according to claim 18, wherein a concave portion is formed at the joint spot of the lapped works on which the spot-joining was performed so as to conform in shape to the pin and the shoulder portion of the joining tool.

40. The outer plate of an automobile according to claim 26, wherein a concave portion is formed at the joint spot of the lapped works on which the spot-joining was performed so as to conform in shape in the pin and the shoulder portion of the joining tool.